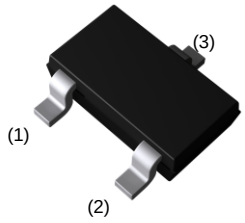
RSR025N05

Nch 45V 2.5A Power MOSFET Datasheet

V_{DSS}	45V
$R_{DS(on)}$ (Max.)	100mΩ
I_D	2.5A
P_D	1.0W

●Outline

TSMT3



●Features

1) Low on - resistance.

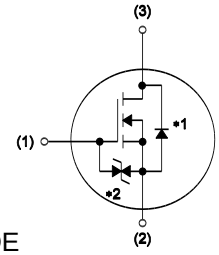
2) Built-in G-S Protection Diode.

3) Small Surface Mount Package (TSMT3).

4) Pb-free lead plating ; RoHS compliant

●Inner circuit

(1) Gate
(2) Source
(3) Drain



∗1 BODY DIODE
∗2 ESD PROTECTION DIODE

●Application

DC/DC converters, Relay drive

●Packaging specifications

Type	Packaging	Taping
	Reel size (mm)	180
	Tape width (mm)	8
	Basic ordering unit (pcs)	3,000
	Taping code	TL
	Marking	ZF

●Absolute maximum ratings(T_a = 25°C)

Parameter	Symbol	Value	Unit
Drain - Source voltage	V_{DSS}	45	V
Continuous drain current	I_D *1	±2.5	A
Pulsed drain current	$I_{D,pulse}$ *2	±10	A
Gate - Source voltage	V_{GSS}	±20	V
Avalanche energy, single pulse	E_{AS} *3	4.8	mJ
Power dissipation	P_D *4	0.54	W
	P_D *5	1.0	W
Junction temperature	T_j	150	°C
Range of storage temperature	T_{stg}	−55 to +150	°C

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●Thermal resistance

Parameter	Symbol	Values			Unit
		Min.	Typ.	Max.	
Thermal resistance, junction - ambient	R_{thJA} *4	-	-	125	°C/W
Thermal resistance, junction - ambient	R_{thJA} *5	-	-	231	°C/W

●Electrical characteristics(T_a = 25°C)

Parameter	Symbol	Conditions	Values			Unit
			Min.	Typ.	Max.	
Drain - Source breakdown voltage	$V_{(BR)DSS}$	V_{GS} = 0V, I_D = 1mA	45	-	-	V
Breakdown voltage temperature coefficient	$\frac{\Delta V_{(BR)DSS}}{\Delta T_j}$	I_D = 1mA referenced to 25°C	-	42	-	mV/°C
Zero gate voltage drain current	I_{DSS}	V_{DS} = 45V, V_{GS} = 0V	-	-	1	μA
Gate - Source leakage current	I_{GSS}	V_{GS} = ±20V, V_{DS} = 0V	-	-	±10	μA
Gate threshold voltage	$V_{GS\ (th)}$	V_{DS} = 10V, I_D = 1mA	1.0	-	3.0	V
Gate threshold voltage temperature coefficient	$\frac{\Delta V_{(GS)th}}{\Delta T_j}$	I_D = 1mA referenced to 25°C	-	–4.2	-	mV/°C
Static drain - source on - state resistance	$R_{DS(on)}$ *6	V_{GS}=10V, I_D=2.5A	-	70	100	mΩ
		V_{GS}=4.5V, I_D=2.5A	-	95	150	
		V_{GS}=4.0V, I_D=2.5A	-	105	160	
		V_{GS}=10V, I_D=2.5A, T_j=125°C	-	110	154	
Gate input resistannce	R_G	f = 1MHz, open drain	-	7	-	Ω
Transconductance	g_{fs} *6	V_{DS} = 10V, I_D = 2.5A	2.0	4.2	-	S

*1 Limited only by maximum temperature allowed.

*2 Pw ≤ 10μs, Duty cycle ≤ 1%

*3 L ≃ 1mH, V_{DD} = 25V, Rg = 25Ω, starting T_j = 25°C

*4 Mounted on a ceramic board (30×30×0.8mm)

*5 Mounted on a FR4 (12×20×0.8mm)

*6 Pulsed

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●Electrical characteristics(T_a = 25°C)

Parameter	Symbol	Conditions	Values			Unit
			Min.	Typ.	Max.	
Input capacitance	C_{iss}	V_{GS} = 0V	-	260	-	pF
Output capacitance	C_{oss}	V_{DS} = 10V	-	90	-	
Reverse transfer capacitance	C_{rss}	f = 1MHz	-	30	-	
Turn - on delay time	$t_{d(on)}$ *6	$V_{DD} \simeq$ 25V, V_{GS} = 10V	-	9	-	ns
Rise time	t_r *6	I_D = 1.25A	-	11	-	
Turn - off delay time	$t_{d(off)}$ *6	R_L = 20Ω	-	25	-	
Fall time	t_f *6	R_G = 10Ω	-	8	-	

●Gate Charge characteristics(T_a = 25°C)

Parameter	Symbol	Conditions	Values			Unit
			Min.	Typ.	Max.	
Total gate charge	Q_g *6	$V_{DD} \simeq$ 25V, I_D = 2.5A V_{GS} = 5V	-	3.6	-	nC
		$V_{DD} \simeq$ 25V, I_D = 2.5A V_{GS} = 10V	-	6	12	
Gate - Source charge	Q_{gs} *6	$V_{DD} \simeq$ 25V, I_D = 2.5A V_{GS} = 5V	-	1.5	-	
Gate - Drain charge	Q_{gd} *6		-	0.8	-	

●Body diode electrical characteristics (Source-Drain)(T_a = 25°C)

Parameter	Symbol	Conditions	Values			Unit
			Min.	Typ.	Max.	
Inverse diode continuous, forward current	I_S *1	T_a = 25°C	-	-	0.8	A
Forward voltage	V_{SD} *6	V_{GS} = 0V, I_s = 2.5A	-	-	1.2	V

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●Electrical characteristic curves

Fig.1 Power Dissipation Derating Curve

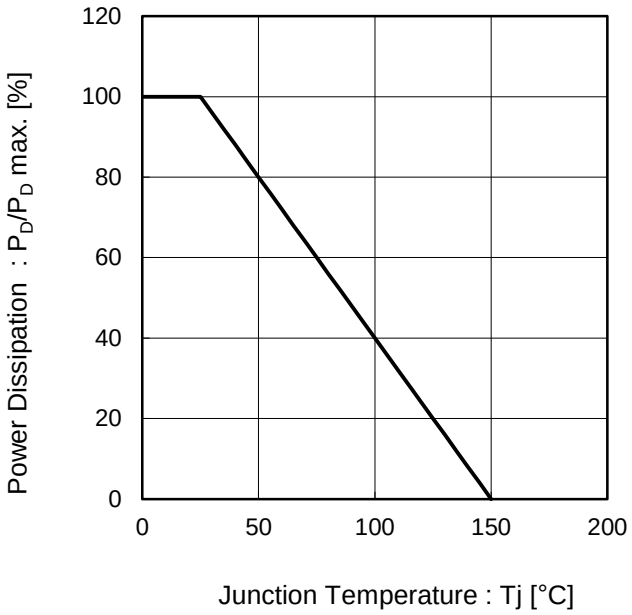


Fig.2 Maximum Safe Operating Area

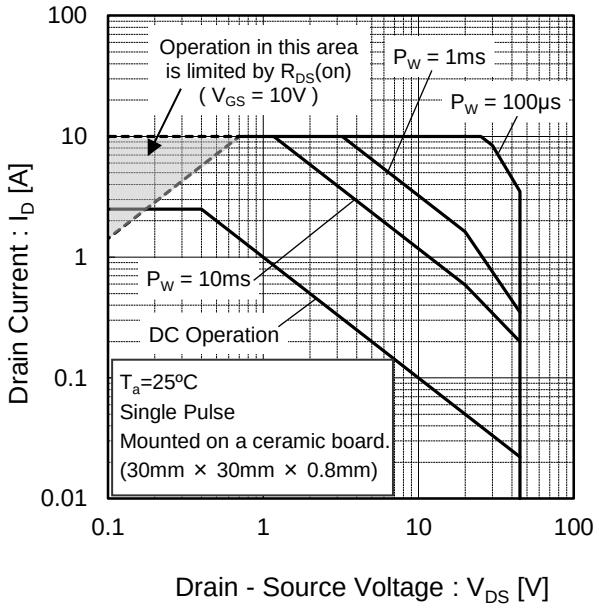


Fig.3 Normalized Transient Thermal Resistance vs. Pulse Width

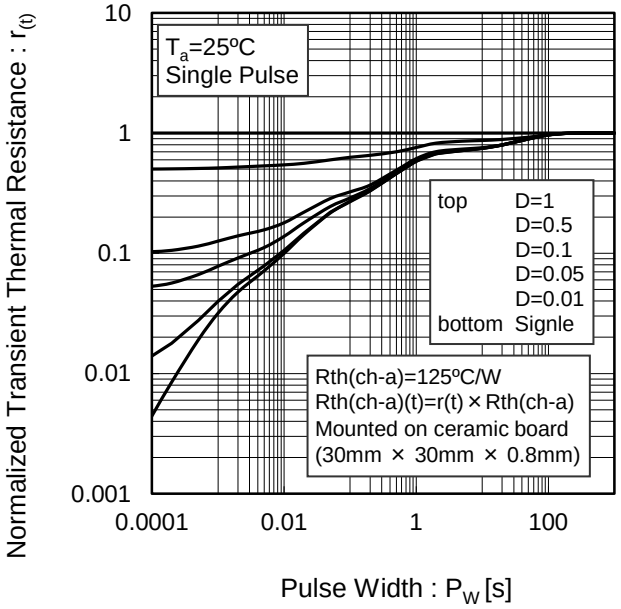
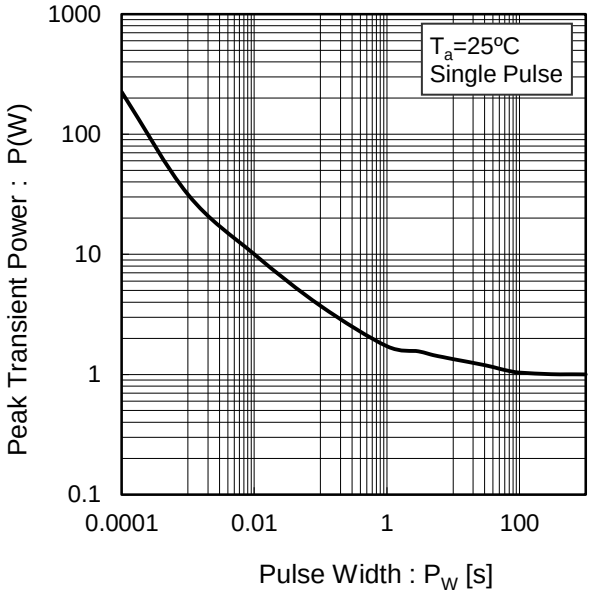


Fig.4 Single Pulse Maxmum Power dissipation



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●Electrical characteristic curves

Fig.5 Avalanche Current vs Inductive Load

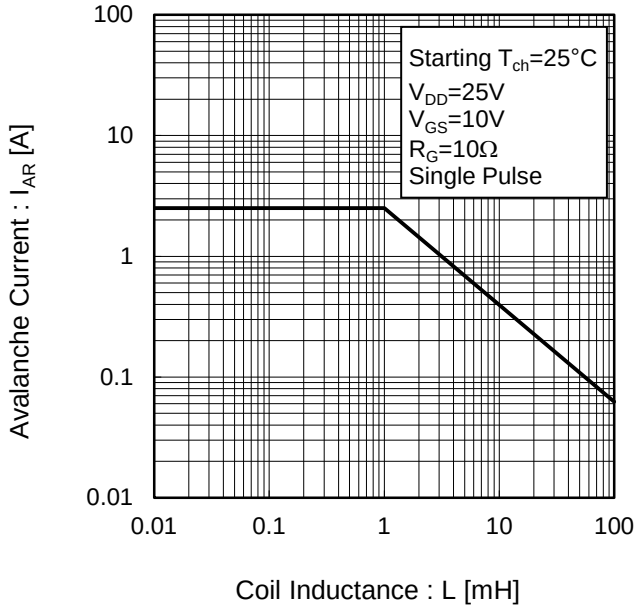


Fig.6 Avalanche Energy Derating Curve vs Junction Temperature

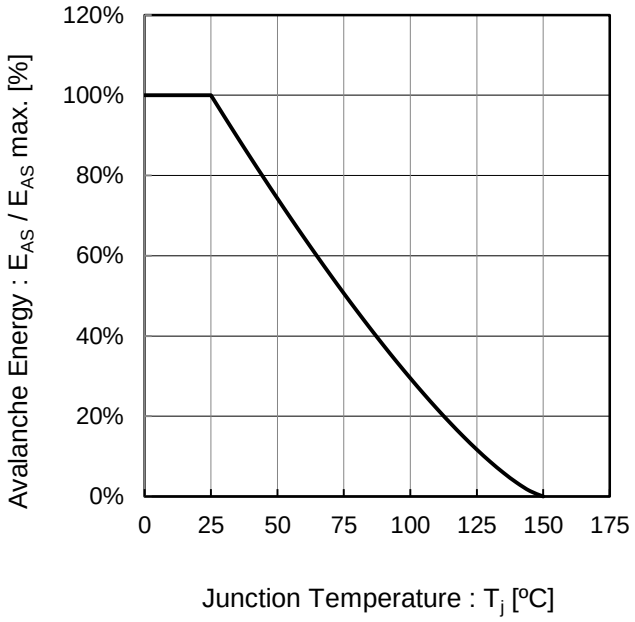


Fig.7 Typical Output Characteristics(I)

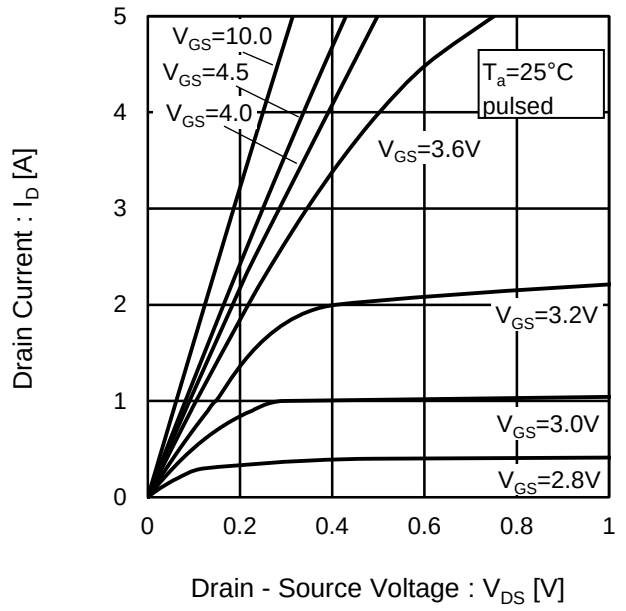
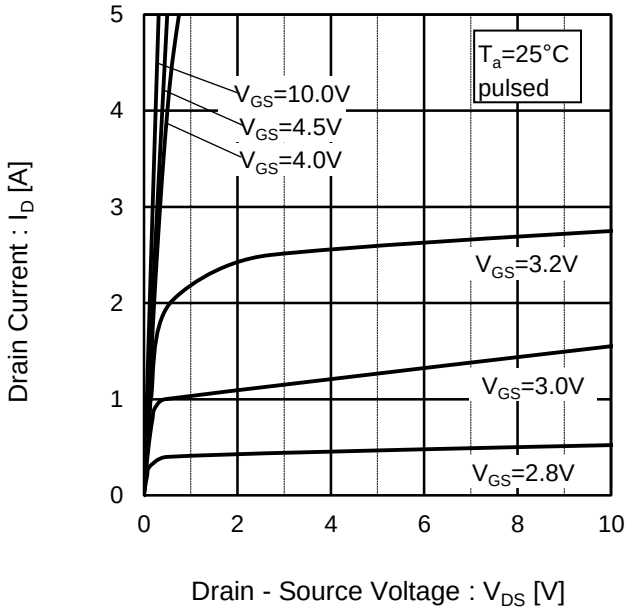


Fig.8 Typical Output Characteristics(II)



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●Electrical characteristic curves

Fig.9 Breakdown Voltage vs. Junction Temperature

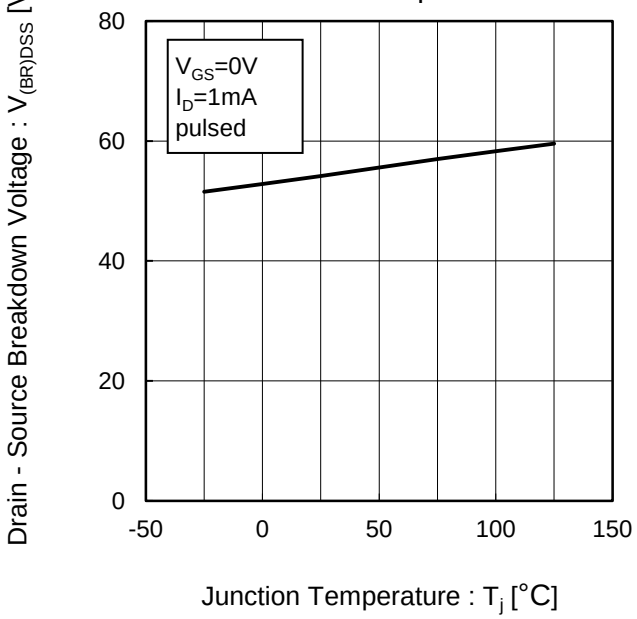


Fig.10 Typical Transfer Characteristics

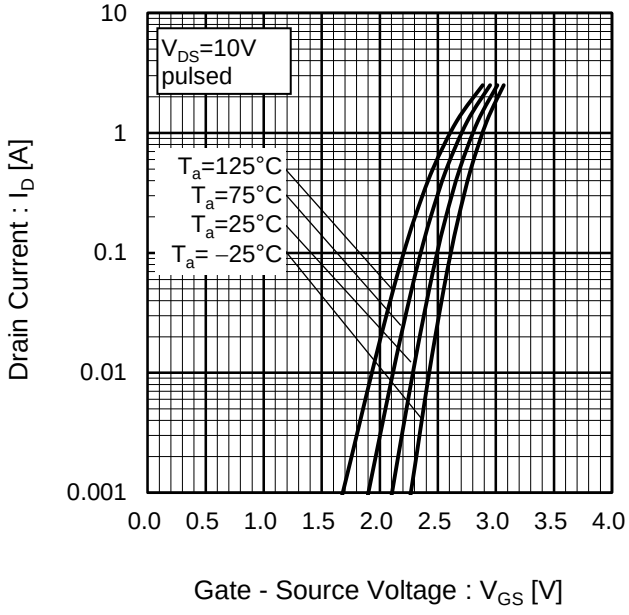


Fig.11 Gate Threshold Voltage vs. Junction Temperature

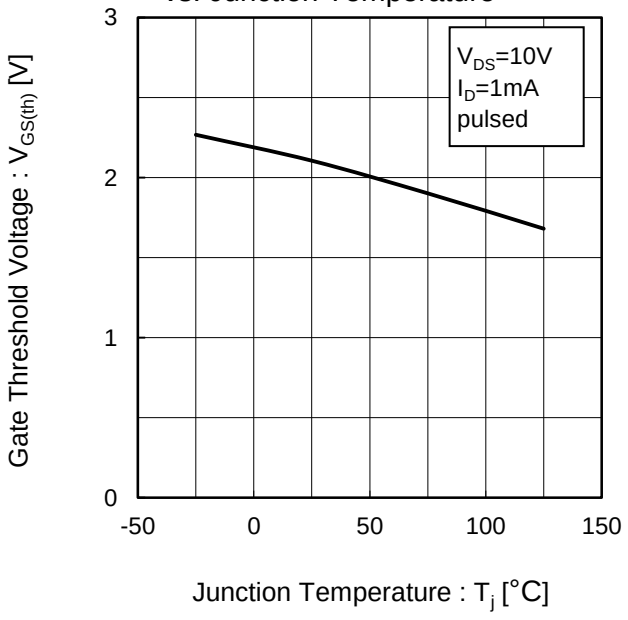
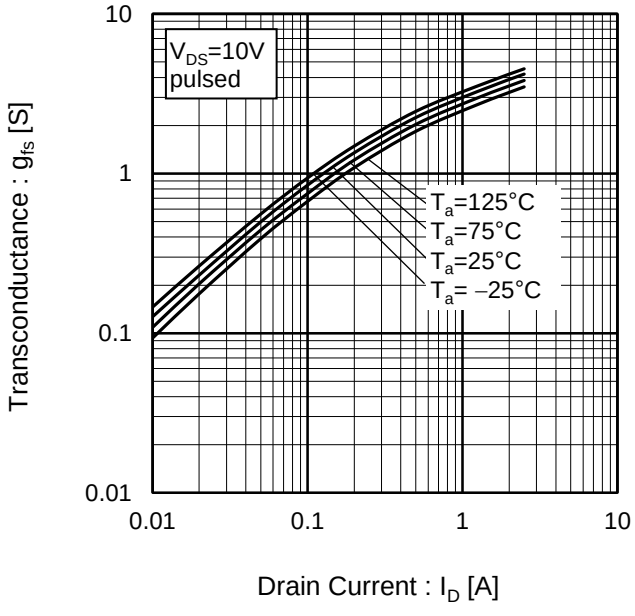


Fig.12 Transconductance vs. Drain Current



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●Electrical characteristic curves

Fig.13 Drain CurrentDerating Curve

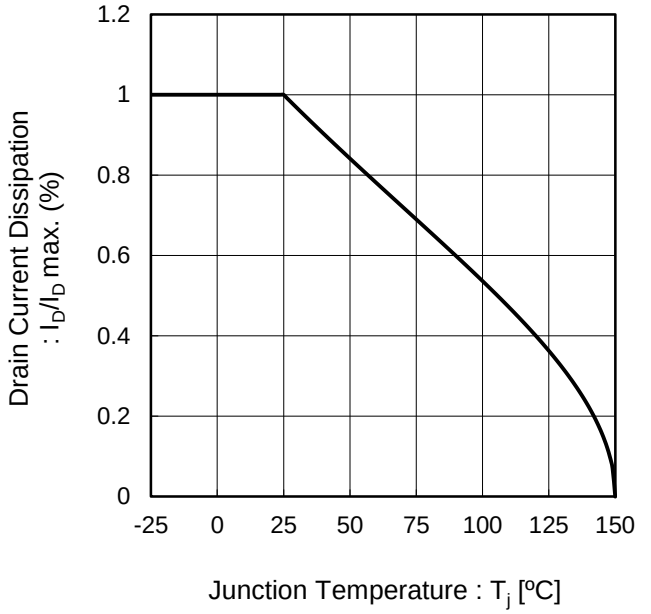


Fig.14 Static Drain - Source On - State Resistance vs. Gate Source Voltage

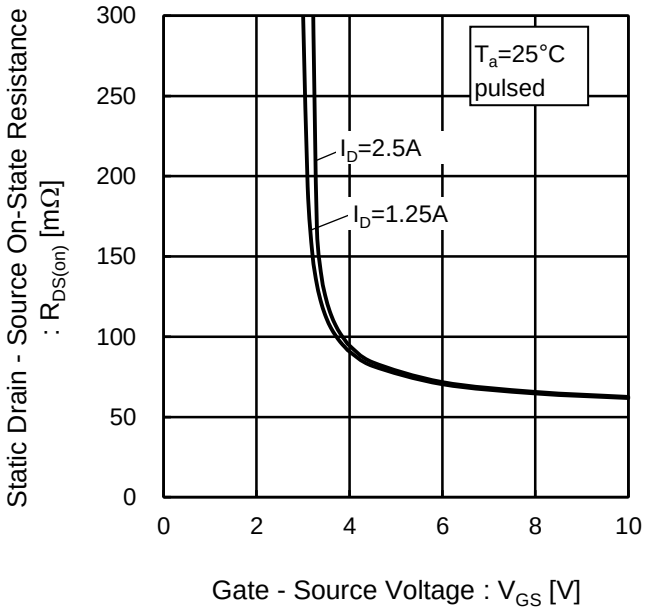


Fig.15 Static Drain - Source On - State Resistance vs. Drain Current(I)

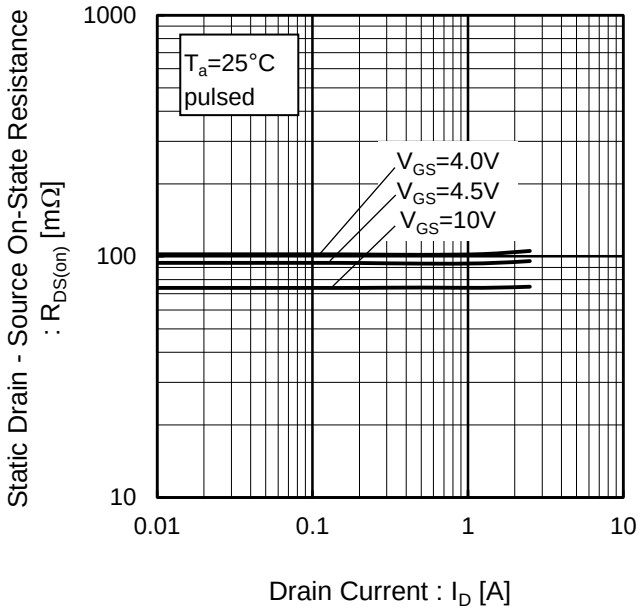
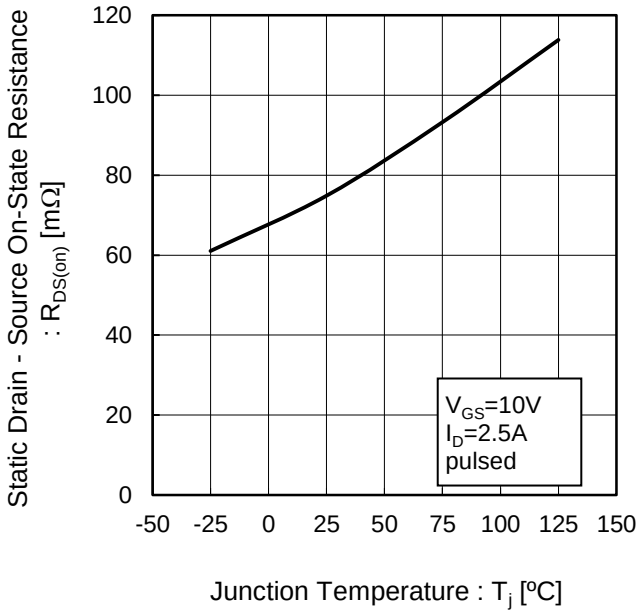


Fig.16 Static Drain - Source On - State Resistance vs. Junction Temperature



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●Electrical characteristic curves

Fig.17 Static Drain-Source On-State Resistance vs. Drain Current(II)

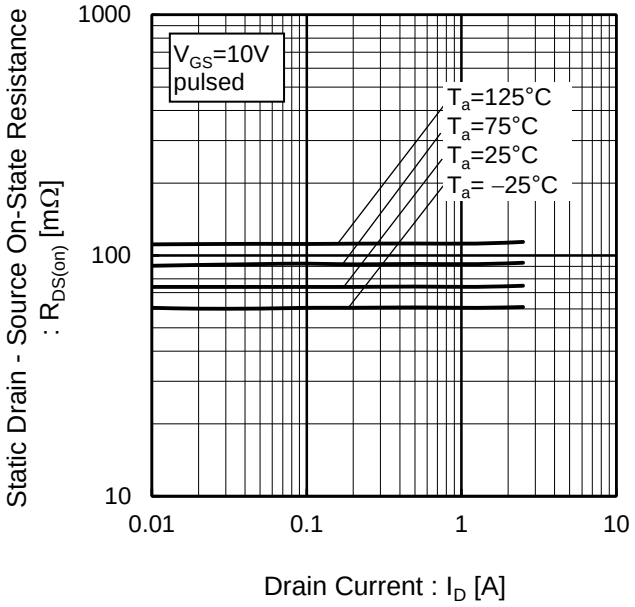


Fig.18 Static Drain - Source On - State Resistance vs. Drain Current(III)

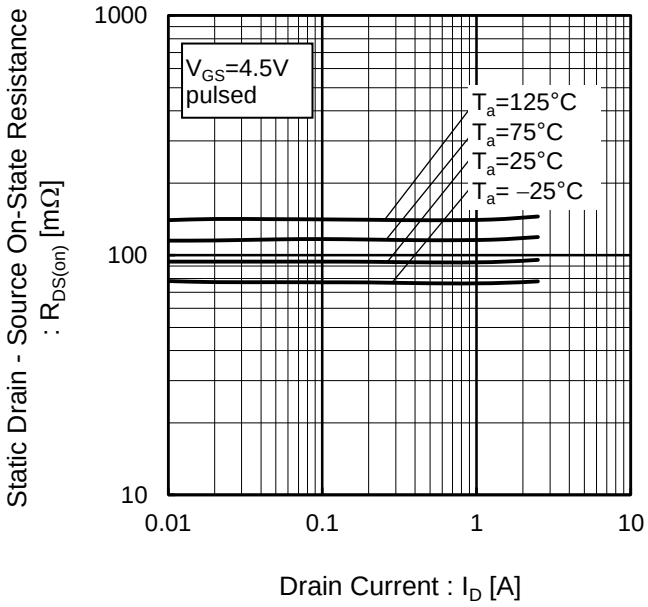
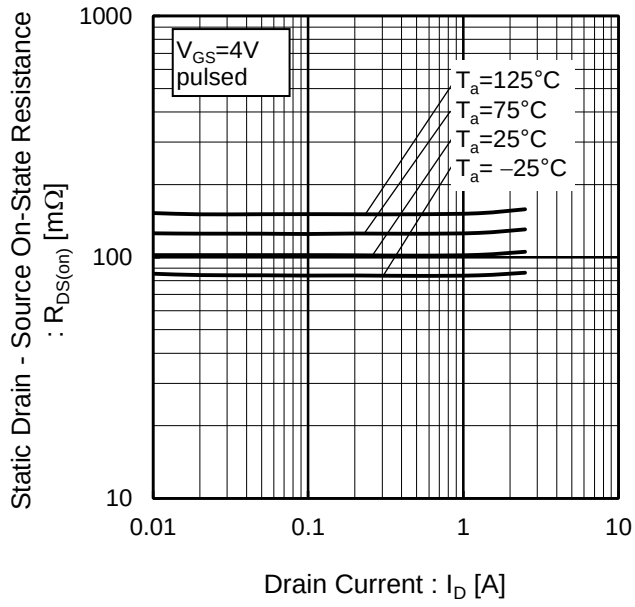


Fig.19 Static Drain - Source On - State Resistance vs. Drain Current(IV)



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●Electrical characteristic curves

Fig.20 Typical Capacitance vs. Drain - Source Voltage

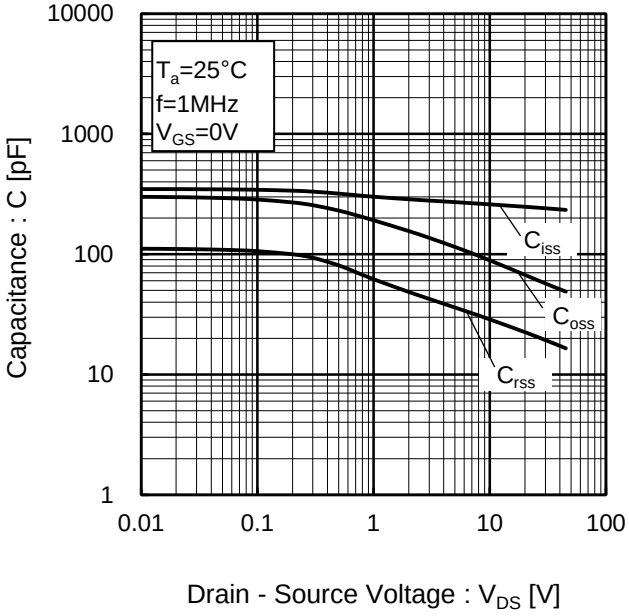


Fig.21 Switching Characteristics

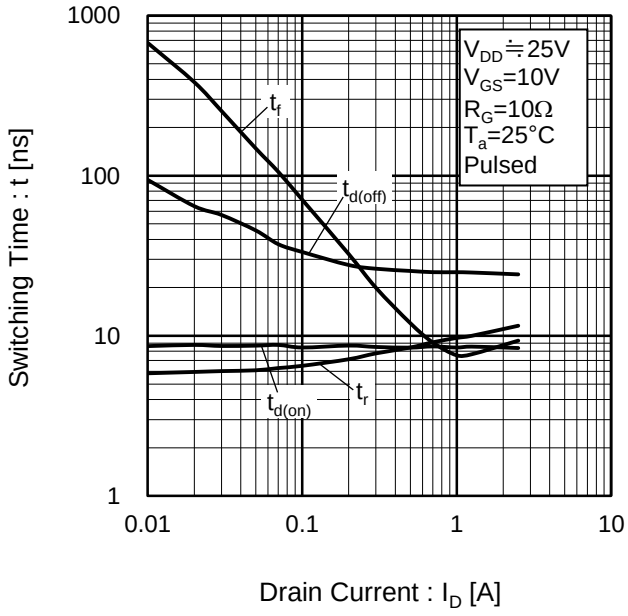


Fig.22 Dynamic Input Characteristics

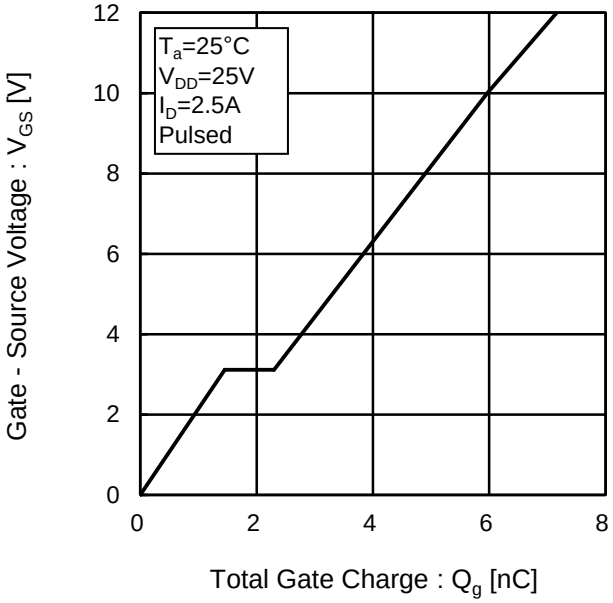
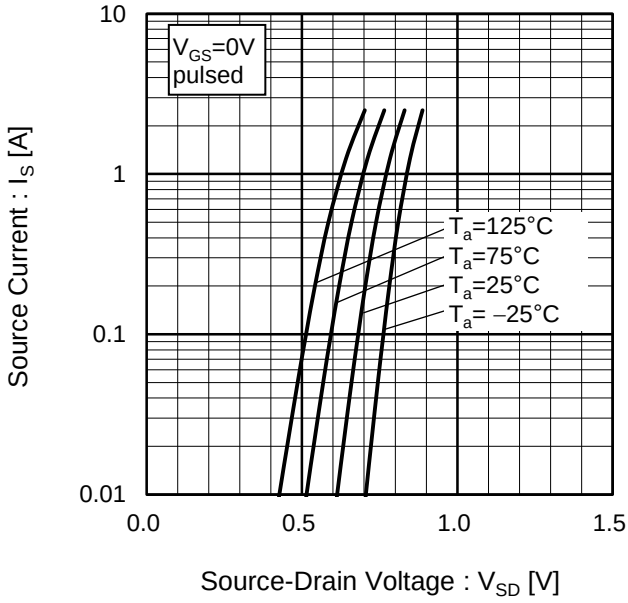


Fig.23 Source Current vs. Source Drain Voltage



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●Measurement circuits

Fig.1-1 Switching Time Measurement Circuit

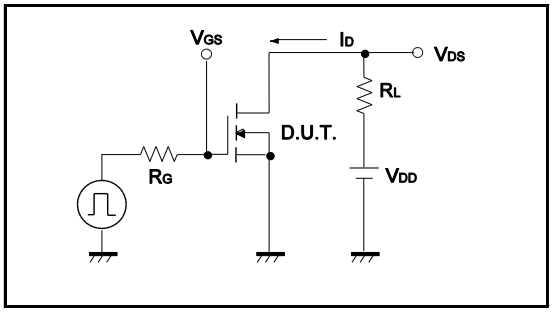


Fig.1-2 Switching Waveforms

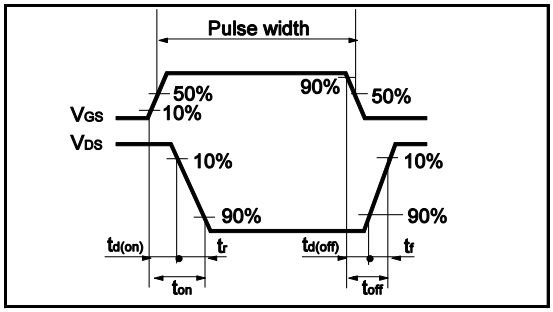


Fig.2-1 Gate Charge Measurement Circuit

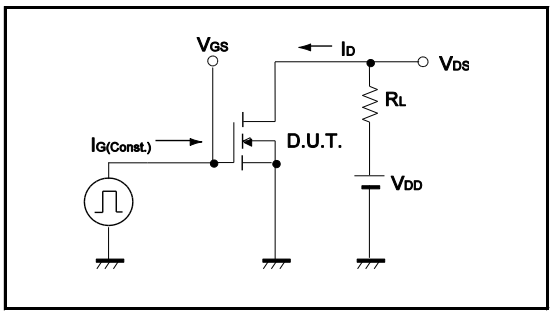


Fig.2-2 Gate Charge Waveform

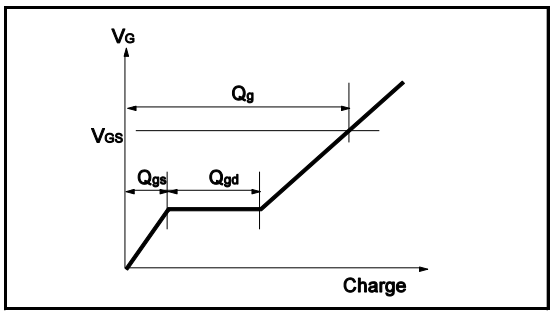


Fig.3-1 Avalanche Measurement Circuit

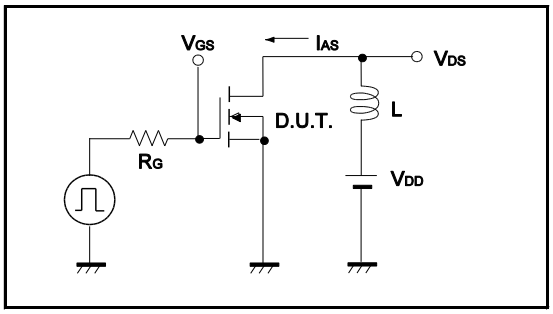
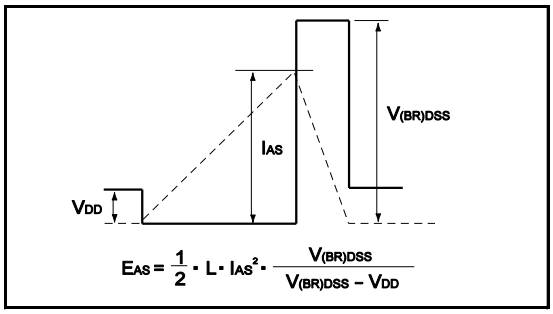


Fig.3-2 Avalanche Waveform



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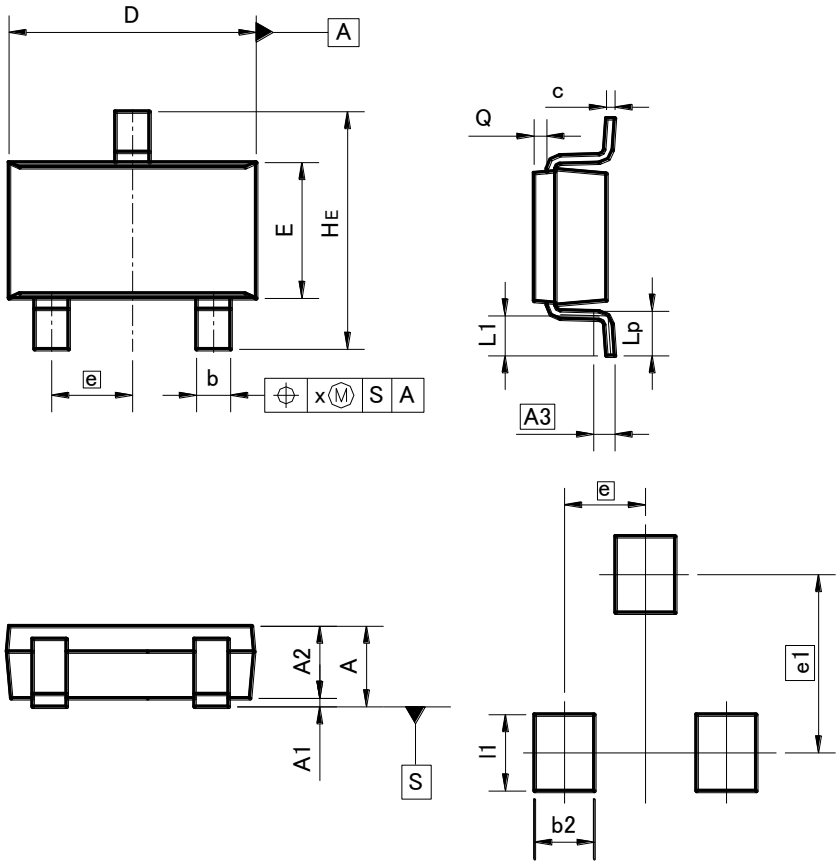
●**Dimensions** (Unit : mm)

TSMT3



Patterm of terminal position areas

DIM	MILIMETERS		INCHES	
	MIN	MAX	MIN	MAX
A	−	1.00	−	0.039
A1	0.00	0.10	0	0.004
A2	0.75	0.95	0.03	0.037
A3	0.25		0.01	
b	0.35	0.50	0.014	0.02
c	0.10	0.26	0.004	0.01
D	2.80	3.00	0.11	0.118
E	1.50	1.80	0.059	0.071
e	0.95		0.04	
HE	2.60	3.00	0.102	0.118
L1	0.30	0.60	0.012	0.024
Lp	0.40	0.70	0.016	0.028
Q	0.05	0.25	0.002	0.01
x	−	0.20	−	0.008

DIM	MILIMETERS		INCHES	
	MIN	MAX	MIN	MAX
e1	2.10		0.08	
b2		0.70	−	0.028
l1	−	0.90	−	0.035

Dimension in mm/inches

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